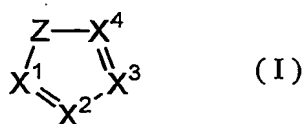
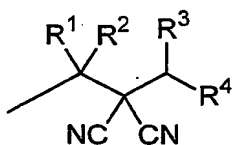


## CLAIMS

1. A malononitrile compound represented by the formula  
(I):



5 wherein any one of  $X^1$ ,  $X^2$ ,  $X^3$  and  $X^4$  is  $CR^{100}$ ,  
(wherein  $R^{100}$  represents a group represented by the formula:



wherein  $R^1$  represents C1-C5 alkyl optionally substituted  
with one or more halogen, C2-C5 alkenyl optionally  
10 substituted with one or more halogen, C2-C5 alkynyl  
optionally substituted with one or more halogen, or  
hydrogen,  
 $R^2$  represents C1-C5 alkyl optionally substituted with one  
or more halogen, C1-C5 alkoxy optionally substituted with  
15 one or more halogen, C2-C5 alkenyl optionally substituted  
with one or more halogen, C2-C5 alkynyl optionally  
substituted with one or more halogen, cyano or hydrogen,  
 $R^3$  and  $R^4$  each represent C1-C5 alkyl optionally substituted  
with one or more halogen, C2-C5 alkenyl optionally  
20 substituted with one or more halogen, C2-C5 alkynyl  
optionally substituted with one or more halogen, C3-C5  
cycloalkyl optionally substituted with one or more halogen,

C4-C5 cycloalkenyl optionally substituted with one or more halogen, or hydrogen,

or R<sup>3</sup> and R<sup>4</sup> are taken together to represent C2-C6

alkanediyl optionally substituted with one or more halogen

5 or C4-C6 alkenediyl optionally substituted with one or more halogen),

the other three of X<sup>1</sup>, X<sup>2</sup>, X<sup>3</sup> and X<sup>4</sup> each represent nitrogen or CR<sup>5</sup>, provided that one to three of X<sup>1</sup>, X<sup>2</sup>, X<sup>3</sup> and X<sup>4</sup> represent nitrogen,

10 Z represents oxygen, sulfur or NR<sup>6</sup>,

R<sup>5</sup> independently represents halogen, cyano, nitro, hydroxyl, mercapto, formyl, SF<sub>5</sub>, carboxyl, C1-C5 alkyl optionally substituted with one or more halogen, C2-C5 alkenyl

optionally substituted with one or more halogen, C2-C5

15 alkynyl optionally substituted with one or more halogen,

C3-C6 cycloalkyl optionally substituted with halogen or one or more C1-C3 alkyl, C1-C5 alkoxy optionally substituted with one or more halogen, C3-C6 alkenyloxy optionally

substituted with one or more halogen, C3-C6 alkynyloxy

20 optionally substituted with one or more halogen, C1-C5

alkylthio optionally substituted with one or more halogen,

C3-C5 alkenylthio optionally substituted with one or more

halogen, C3-C5 alkynylthio optionally substituted with one

or more halogen, C1-C5 alkylsulfinyl optionally substituted

25 with one or more halogen, C1-C5 alkylsulfonyl optionally

substituted with one or more halogen, C2-C6 alkylcarbonyl optionally substituted with one or more halogen, C2-C5 alkoxy carbonyl optionally substituted with one or more halogen, a group represented by  $\text{NR}^{10}\text{R}^{11}$ , a group represented by  $\text{C}(=\text{X}^5)\text{NR}^{12}\text{R}^{13}$ , a group represented by  $(\text{CH}_2)_m\text{Q}$ , a group represented by  $\text{C}(=\text{NOR}^{17})\text{R}^{18}$ , a group represented by  $\text{C}(\text{OR}^{19})\text{R}^{20}\text{R}^{21}$ , or hydrogen,  $\text{R}^6$  represents C1-C5 alkyl optionally substituted with one or more halogen, C3-C5 alkenyl optionally substituted with one or more halogen, C3-C5 alkynyl optionally substituted with one or more halogen, C3-C6 cycloalkyl optionally substituted with one or more halogen, (C1-C5 alkoxy optionally substituted with one or more halogen)C1-C3 alkyl, C1-C5 alkylsulfinyl optionally substituted with one or more halogen, C1-C5 alkylsulfonyl optionally substituted with one or more halogen, C2-C6 alkylcarbonyl optionally substituted with one or more halogen, C2-C5 alkoxy carbonyl optionally substituted with one or more halogen, a group represented by  $\text{C}(=\text{X}^5)\text{NR}^{12}\text{R}^{13}$ , a group represented by  $(\text{CH}_2)_m\text{Q}$ , or hydrogen, and when two  $\text{CR}^5$ , or  $\text{CR}^5$  and  $\text{NR}^6$  are adjacent to each other, they may be taken together to represent C2-C6 alkanediyl or C4-C6 alkenediyl optionally substituted with one or more halogen, in which at least one methylene group forming the alkanediyl or the alkenediyl may be substituted with oxygen,

sulfur or NR<sup>7</sup>,

R<sup>7</sup> represents C1-C5 alkyl optionally substituted with one or more halogen, C3-C5 alkenyl optionally substituted with one or more halogen, C3-C5 alkynyl optionally substituted with one or more halogen, C3-C6 cycloalkyl optionally substituted with one or more halogen, C2-C6 alkylcarbonyl optionally substituted with one or more halogen, C2-C5 alkoxy carbonyl optionally substituted with one or more halogen; or hydrogen,

10 R<sup>10</sup> and R<sup>11</sup> each represent C1-C5 alkyl optionally substituted with one or more halogen, C3-C5 alkenyl optionally substituted with one or more halogen, C3-C5 alkynyl optionally substituted with one or more halogen, C3-C6 cycloalkyl optionally substituted with one or more halogen, (C1-C5 alkoxy optionally substituted with one or more halogen)C1-C3 alkyl, C1-C5 alkylsulfinyl optionally substituted with one or more halogen, C1-C5 alkylsulfonyl optionally substituted with one or more halogen, C2-C6 alkylcarbonyl optionally substituted with one or more halogen, C2-C5 alkoxy carbonyl optionally substituted with one or more halogen, or hydrogen,

or the group represented by NR<sup>10</sup>R<sup>11</sup> is 1-pyrrolyl,

R<sup>12</sup> and R<sup>13</sup> each represent C1-C5 alkyl optionally substituted with one or more halogen, C3-C5 alkenyl optionally substituted with one or more halogen, C3-C5

alkynyl optionally substituted with one or more halogen,  
C3-C6 cycloalkyl optionally substituted with one or more  
halogen, a group represented by  $(CH_2)_mQ$ , or hydrogen,  
or  $R^{12}$  and  $R^{13}$  are taken together to represent C2-C6  
5 alkanediyl optionally substituted with one or more halogen  
or C4-C6 alkenediyl optionally substituted with one or more  
halogen,  
 $R^{17}$  and  $R^{18}$  each represent C1-C5 alkyl optionally  
substituted with one or more halogen, C3-C5 alkenyl  
10 optionally substituted with one or more halogen, C3-C5  
alkynyl optionally substituted with one or more halogen,  
C3-C6 cycloalkyl optionally substituted with one or more  
halogen, a group represented by  $(CH_2)_mQ$ , or hydrogen,  
 $R^{19}$  represents C1-C5 alkyl optionally substituted with one  
15 or more halogen, C3-C5 alkenyl optionally substituted with  
one or more halogen, C3-C5 alkynyl optionally substituted  
with one or more halogen, C3-C6 cycloalkyl optionally  
substituted with one or more halogen, (C1-C5 alkoxy  
optionally substituted with one or more halogen)C1-C3 alkyl,  
20 C1-C5 alkylsulfinyl optionally substituted with one or more  
halogen, C1-C5 alkylsulfonyl optionally substituted with  
one or more halogen, C2-C6 alkylcarbonyl optionally  
substituted with one or more halogen, C2-C5 alkoxy carbonyl  
optionally substituted with one or more halogen, a group  
25 represented by  $C(=X^5)NR^{12}R^{13}$ , a group represented by  $(CH_2)_mQ$ ,

trialkylsilyl, or hydrogen,

R<sup>20</sup> and R<sup>21</sup> each represent C1-C5 alkyl optionally  
substituted with one or more halogen, C2-C5 alkenyl  
optionally substituted with one or more halogen, C2-C5

5 alkynyl optionally substituted with one or more halogen,  
C3-C6 cycloalkyl optionally substituted with one or more  
halogen, or hydrogen,

Q represents aryl optionally substituted with R<sup>14</sup> n times,

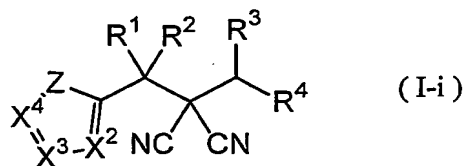
R<sup>14</sup> independently represents C1-C5 alkyl optionally  
10 substituted with one or more halogen, C3-C6 cycloalkyl  
optionally substituted with one or more halogen, C1-C5  
alkoxy optionally substituted with one or more halogen, C1-  
C5 alkylthio optionally substituted with one or more  
halogen, C3-C5 alkenylthio optionally substituted with one  
15 or more halogen, C3-C5 alkynylthio optionally substituted  
with one or more halogen, C1-C5 alkylsulfinyl optionally  
substituted with one or more halogen, C1-C5 alkylsulfonyl  
optionally substituted with one or more halogen, C2-C6  
alkylcarbonyl optionally substituted with one or more  
20 halogen, C2-C5 alkoxy carbonyl optionally substituted with  
one or more halogen, or halogen,

m and n each represent an integer of 0 to 5, and

X<sup>5</sup> represents oxygen or sulfur.

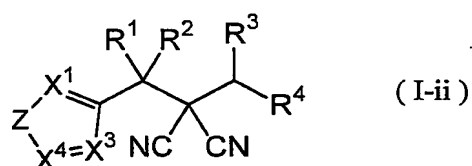
25 2. The malononitrile compound according to claim 1, which

is represented by the formula (I-i):



wherein  $R^1$ ,  $R^2$ ,  $R^3$ ,  $R^4$  and  $Z$  are as defined in claim 1, one to three of  $X^2$ ,  $X^3$  and  $X^4$  represent nitrogen and when one or  
 5 two of  $X^2$ ,  $X^3$  and  $X^4$  represent nitrogen, the other two or one represents  $CR^5$ , and  $R^5$  is as defined in claim 1.

3. The malononitrile compound according to claim 1, which is represented by the formula (I-ii):

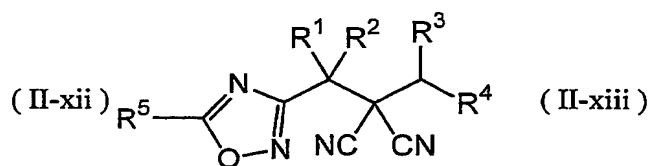
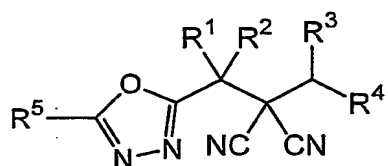
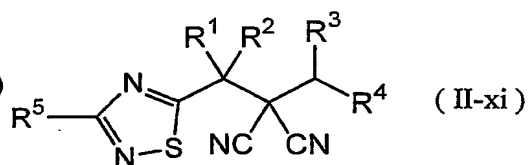
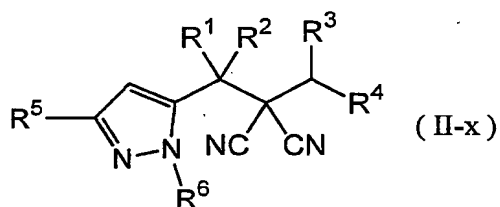
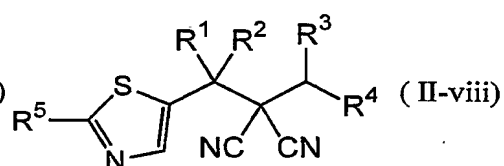
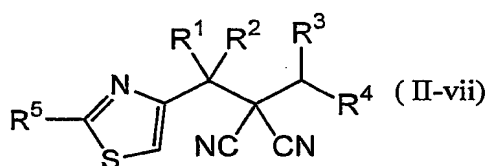
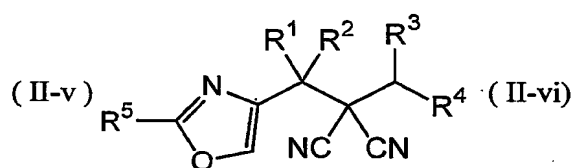
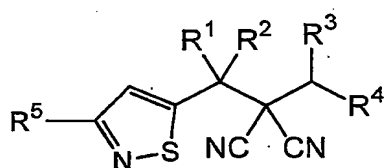
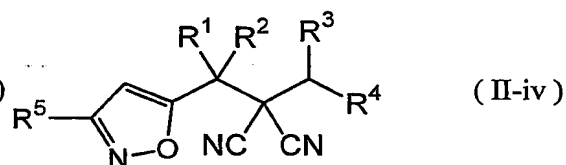
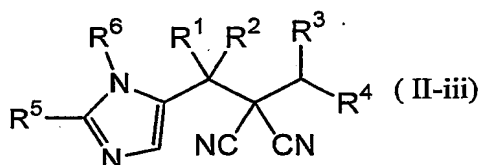
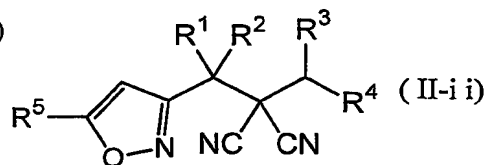
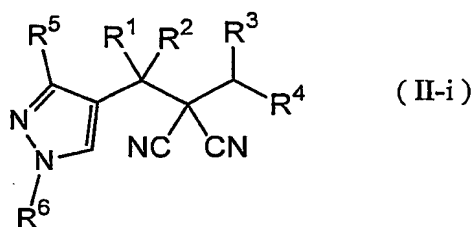


10

wherein  $R^1$ ,  $R^2$ ,  $R^3$ ,  $R^4$  and  $Z$  are as defined in claim 1, one to three of  $X^1$ ,  $X^3$  and  $X^4$  represent nitrogen and when one or  
 two of  $X^1$ ,  $X^3$  and  $X^4$  represent nitrogen, the other two or one represents  $CR^5$ , and  $R^5$  is as defined in claim 1.

15

4. The malononitrile compound according to claim 1, which is represented by any one of the formula (II-i) to (II-xiii):



wherein R<sup>1</sup> represents C1-C5 alkyl optionally substituted with one or more halogen, C2-C5 alkenyl optionally



substituted with one or more halogen, C2-C5 alkynyl  
optionally substituted with one or more halogen, or  
hydrogen,

R<sup>2</sup> represents C1-C5 alkyl optionally substituted with one  
5 or more halogen, C1-C5 alkoxy optionally substituted with  
one or more halogen, C2-C5 alkenyl optionally substituted  
with one or more halogen, C2-C5 alkynyl optionally  
substituted with one or more halogen, cyano or hydrogen,

R<sup>3</sup> and R<sup>4</sup> each represent C1-C5 alkyl optionally substituted  
10 with one or more halogen, C2-C5 alkenyl optionally  
substituted with one or more halogen, C2-C5 alkynyl  
optionally substituted with one or more halogen, C3-C5  
cycloalkyl optionally substituted with one or more halogen,  
C4-C5 cycloalkenyl optionally substituted with one or more  
15 halogen, or hydrogen,

or R<sup>3</sup> and R<sup>4</sup> are taken together to represent C2-C6  
alkanediyl optionally substituted with one or more halogen  
or C4-C6 alkenediyl optionally substituted with one or more  
halogen,

R<sup>5</sup> represents halogen, cyano, nitro, formyl, SF<sub>5</sub>, C1-C5  
20 alkyl optionally substituted with one or more halogen, C2-  
C5 alkenyl optionally substituted with one or more halogen,  
C2-C5 alkynyl optionally substituted with one or more  
halogen, C3-C6 cycloalkyl optionally substituted with one  
25 or more halogen or one or more C1-C3 alkyl, C1-C5 alkoxy

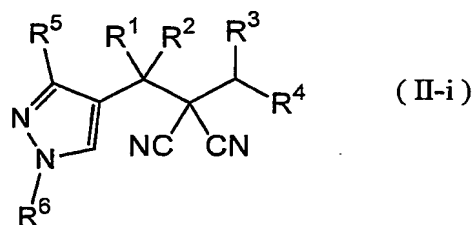
optionally substituted with one or more halogen, C3-C6  
alkenyloxy optionally substituted with one or more halogen,  
C3-C6 alkynyloxy optionally substituted with one or more  
halogen, C1-C5 alkylthio optionally substituted with one or  
5 more halogen, C3-C5 alkenylthio optionally substituted with  
one or more halogen, C3-C5 alkynylthio optionally  
substituted with one or more halogen, C1-C5 alkylsulfinyl  
optionally substituted with one or more halogen, C1-C5  
alkylsulfonyl optionally substituted with one or more  
10 halogen, C2-C6 alkylcarbonyl optionally substituted with  
one or more halogen, a group represented by  $C(OR^{19})R^{20}R^{21}$ , or  
hydrogen,  
 $R^6$  represents C1-C5 alkyl optionally substituted with one  
or more halogen,  
15  $R^{19}$  represents C1-C5 alkyl optionally substituted with one  
or more halogen, C3-C5 alkynyl optionally substituted with  
one or more halogen, or hydrogen, and  
 $R^{20}$  and  $R^{21}$  each represent C1-C5 alkyl optionally  
substituted with one or more halogen, or hydrogen.

20

5. The malononitrile compound according to claim 4,  
wherein  $R^1$  is hydrogen,  
 $R^2$  is C1-C5 alkyl optionally substituted with one or more  
halogen, or hydrogen,  
25  $R^3$  and  $R^4$  each are C1-C5 alkyl optionally substituted with

one or more halogen, C2-C5 alkenyl optionally substituted  
with one or more halogen, or hydrogen,  
R<sup>5</sup> is halogen, C1-C5 alkyl optionally substituted with one  
or more halogen, C3-C6 cycloalkyl optionally substituted  
5 with one or more halogen, C1-C5 alkoxy optionally  
substituted with one or more halogen, C3-C6 alkenyloxy  
optionally substituted with one or more halogen, C3-C6  
alkynyloxy optionally substituted with one or more halogen,  
C1-C5 alkylthio optionally substituted with one or more  
10 halogen, C1-C5 alkylsulfinyl optionally substituted with  
one or more halogen, C1-C5 alkylsulfonyl optionally  
substituted with one or more halogen, a group represented  
by C(OR<sup>19</sup>)R<sup>20</sup>R<sup>21</sup>, or hydrogen,  
R<sup>6</sup> is C1-C5 alkyl optionally substituted with one or more  
15 halogen,  
R<sup>19</sup> represents C1-C5 alkyl optionally substituted with one  
or more halogen, C3-C5 alkynyl optionally substituted with  
one or more halogen, or hydrogen, and  
R<sup>20</sup> and R<sup>21</sup> each represent C1-C5 alkyl optionally  
20 substituted with one or more halogen, or hydrogen.

6. The malononitrile compound according to claim 1, which  
is represented by the formula (II-i):



wherein R<sup>1</sup> represents C1-C5 alkyl optionally substituted  
with one or more halogen, C2-C5 alkenyl optionally  
substituted with one or more halogen, C2-C5 alkynyl  
5 optionally substituted with one or more halogen, or  
hydrogen,

R<sup>2</sup> represents C1-C5 alkyl optionally substituted with one  
or more halogen, C1-C5 alkoxy optionally substituted with  
one or more halogen, C2-C5 alkenyl optionally substituted  
10 with one or more halogen, C2-C5 alkynyl optionally  
substituted with one or more halogen, cyano or hydrogen,

R<sup>3</sup> and R<sup>4</sup> each represent C1-C5 alkyl optionally substituted  
with one or more halogen, C2-C5 alkenyl optionally  
substituted with one or more halogen, C2-C5 alkynyl

15 optionally substituted with one or more halogen, C3-C5  
cycloalkyl optionally substituted with one or more halogen,  
C4-C5 cycloalkenyl optionally substituted with one or more  
halogen, or hydrogen,

or R<sup>3</sup> and R<sup>4</sup> are taken together to represent C2-C6

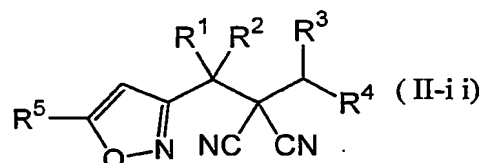
20 alkanediyl optionally substituted with one or more halogen  
or C4-C6 alkenediyl optionally substituted with one or more  
halogen,

R<sup>5</sup> represents halogen, cyano, nitro, formyl, SF<sub>5</sub>, C1-C5 alkyl optionally substituted with one or more halogen, C2-C5 alkenyl optionally substituted with one or more halogen, C2-C5 alkynyl optionally substituted with one or more halogen, C3-C6 cycloalkyl optionally substituted with one or more halogen or one or more C1-C3 alkyl, C1-C5 alkoxy optionally substituted with one or more halogen, C3-C6 alkenyloxy optionally substituted with one or more halogen, C3-C6 alkynyloxy optionally substituted with one or more halogen, C1-C5 alkylthio optionally substituted with one or more halogen, C3-C5 alkenylthio optionally substituted with one or more halogen, C3-C5 alkynylthio optionally substituted with one or more halogen, C1-C5 alkylsulfinyl optionally substituted with one or more halogen, C1-C5 alkylsulfonyl optionally substituted with one or more halogen, C2-C6 alkylcarbonyl optionally substituted with one or more halogen a group represented by C(OR<sup>19</sup>)R<sup>20</sup>R<sup>21</sup>, or hydrogen, R<sup>6</sup> represents C1-C5 alkyl optionally substituted with one or more halogen,

R<sup>19</sup> represents C1-C5 alkyl optionally substituted with one or more halogen, C3-C5 alkynyl optionally substituted with one or more halogen, or hydrogen, and

R<sup>20</sup> and R<sup>21</sup> each represent C1-C5 alkyl optionally substituted with one or more halogen, or hydrogen.

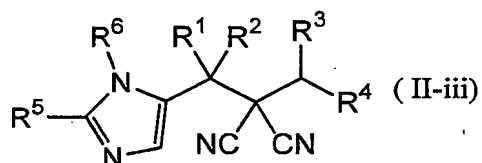
7. The malononitrile compound according to claim 1, which is represented by the formula (II-ii):



wherein R<sup>1</sup>, R<sup>2</sup>, R<sup>3</sup>, R<sup>4</sup> and R<sup>5</sup> are as defined in claim 6.

5

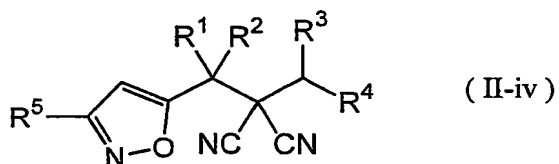
8. The malononitrile compound according to claim 1, which is represented by the formula (II-iii):



wherein R<sup>1</sup>, R<sup>2</sup>, R<sup>3</sup>, R<sup>4</sup>, R<sup>5</sup> and R<sup>6</sup> are as defined in claim 6.

10

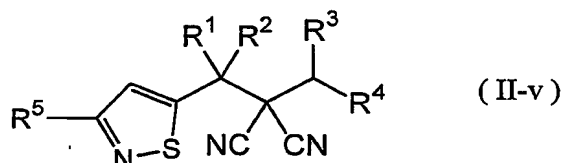
9. The malononitrile compound according to claim 1, which is represented by the formula (II-iv):



wherein R<sup>1</sup>, R<sup>2</sup>, R<sup>3</sup>, R<sup>4</sup> and R<sup>5</sup> are as defined in claim 6.

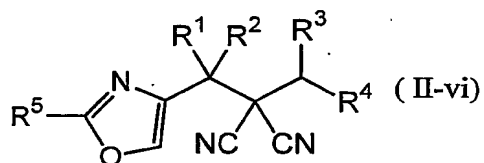
15

10. The malononitrile compound according to claim 1, which is represented by the formula (II-v):



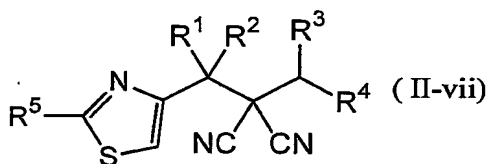
wherein  $R^1$ ,  $R^2$ ,  $R^3$ ,  $R^4$  and  $R^5$  are as defined in claim 6.

11. The malononitrile compound according to claim 1, which  
5 is represented by the formula (II-vi):



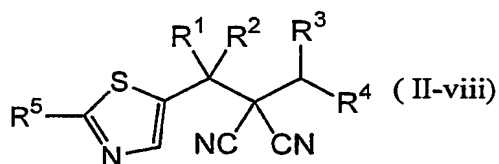
wherein  $R^1$ ,  $R^2$ ,  $R^3$ ,  $R^4$  and  $R^5$  are as defined in claim 6.

12. The malononitrile compound according to claim 1, which  
10 is represented by the formula (II-vii):



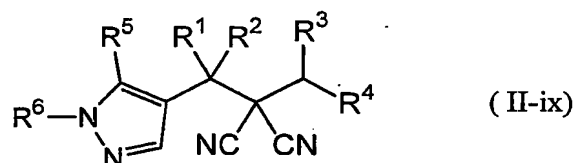
wherein  $R^1$ ,  $R^2$ ,  $R^3$ ,  $R^4$  and  $R^5$  are as defined in claim 6.

13. The malononitrile compound according to claim 1, which  
15 is represented by the formula (II-viii):



wherein  $R^1$ ,  $R^2$ ,  $R^3$ ,  $R^4$  and  $R^5$  are as defined in claim 6.

14. The malononitrile compound according to claim 1, which is represented by the formula (II-ix):



5 wherein R<sup>1</sup>, R<sup>2</sup>, R<sup>3</sup>, R<sup>4</sup>, R<sup>5</sup> and R<sup>6</sup> are as defined in claim 6.

15. The malononitrile compound according to any one of claims 6 to 14, wherein R<sup>1</sup> is hydrogen,

10 R<sup>2</sup> is C1-C5 alkyl optionally substituted with one or more halogen, or hydrogen,

R<sup>3</sup> and R<sup>4</sup> each are C1-C5 alkyl optionally substituted with one or more halogen, C2-C5 alkenyl optionally substituted with one or more halogen, or hydrogen,

15 R<sup>5</sup> is halogen, C1-C5 alkyl optionally substituted with one or more halogen, C3-C6 cycloalkyl optionally substituted with one or more halogen, C1-C5 alkoxy optionally

substituted with one or more halogen, C3-C6 alkenyloxy optionally substituted with one or more halogen, C3-C6

alkynyloxy optionally substituted with one or more halogen,

20 C1-C5 alkylthio optionally substituted with one or more

halogen, C1-C5 alkylsulfinyl optionally substituted with

one or more halogen, C1-C5 alkylsulfonyl optionally

substituted with one or more halogen, a group represented



by  $C(OR^{19})R^{20}R^{21}$ , or hydrogen,

$R^6$  is C1-C5 alkyl optionally substituted with one or more halogen,

$R^{19}$  represents C1-C5 alkyl optionally substituted with one  
5 or more halogen, C3-C5 alkynyl optionally substituted with  
one or more halogen, or hydrogen, and

$R^{20}$  and  $R^{21}$  each represent C1-C5 alkyl optionally  
substituted with one or more halogen, or hydrogen.

10 16. A pesticidal composition, which comprises an effective  
amount of the malononitrile compound according to claim 1  
and an inert carrier.

15 17. A method for controlling a pest, which comprises  
applying an effective amount of the malononitrile compound  
according to claim 1 to said pest or a place where said  
pest inhabits.

20 18. A use of the malononitrile compound according to claim  
1 as an active ingredient of a pesticidal composition.